ENHANCED PRIM'S ALGORITHM FOR FINDING THE HAMILTONIAN CYCLE IN A GRAPH

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To my beloved mom and dad

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

The Travelling Salesman Problem (TSP) is known as one of the oldest combinatorial optimisation problem which solves the path problem in weighted graph. With the main objective to visiting all places (nodes) in a round trip that start and end in one specific place, TSP shared the same problem with a lot of applications in the world nowadays. In short, the goal of TSP is to find a Hamiltonian cycle. Hamiltonian cycle was introduced in 1800's which is as old as the moment TSP captured the mind of the thinker. Lots of great and major discussions have been made till now and TSP has seen applications in the areas of logistics, genetics, manufacturing, telecommunications, neuroscience and many more. TSP has been intervening in many of the everyday experience by most people and not only for a salesman. Be it a usual errand around the house or the major project by the company or government, TSP has an innate connection in tour finding which lead the attention from various personnel. In another related graph problem, Prim's Algorithm (PA) is widely used to compute the Minimum Spanning Tree (MST) of a graph. In this research, the two algorithms are being related by modifying the PA in order to work out the TSP which will find the Hamiltonian cycle of the graph. This new approach is called Enhanced Prim's Algorithm (EPA) which solves the TSP for fast result.

ABSTRAK

Masalah Perjalanan Jurujual (TSP) dikenali sebagai salah satu daripada masalah pengoptimuman gabungan tertua yang mana ia menyelesaikan masalah perjalanan dalam graf berwajaran. Dengan objektif utama untuk melawat semua tempat (nod) dalam perjalanan di dalam satu pusingan yang bermula dan berakhir di satu tempat tertentu, TSP berkongsi masalah yang sama dengan banyak aplikasi di dunia pada masa kini. Secara ringkasnya, matlamat TSP adalah untuk mencari kitaran Hamilton. Kitaran Hamilton telah diperkenalkan pada tahun 1800-an. Ianya adalah seusia dengan masa TSP mendapat perhatian penyelidik. Banyak perbincangan yang mendalam telah dibuat sehingga kini dan TSP telah muncul dalam banyak aplikasi seperti dalam bidang logistik, genetik, pembuatan, telekomunikasi, neurosains dan banyak lagi. TSP telah terlibat dalam kebanyakan amalan sehari-harian oleh kebanyakan orang dan bukan tertakluk hanya kepada permasalahan jurujual. Tidak kira samada permasalahan di dalam rumah atau di projek-projek utama oleh syarikat atau kerajaan, TSP mempunyai sambungan semula jadi dalam mencari aturan perjalanan yang mendapat perhatian dari pelbagai pihak. Dalam menyelesaikan masalah graf, salah satu algoritma yang digunakan untuk menyelesaikan masalah mencari pohon rentangan yang minimum adalah Algoritma Prim (PA). Dalam kajian ini, kami akan mengaitkan dua algoritma dengan mengubah PA yang sedia ada untuk menyelesaikan masalah TSP yang berfungsi untuk mencari kitaran graf Hamiltonian. Pendekatan baru ini dipanggil Peningkatan Algoritma Prim (EPA) yang menyelesaikan TSP bagi mendapat hasil yang cepat.